Timing of Enhanced Post-Deployment Screening: Exploration of Participants' Preferences and of the Associations among Timing, the Prevalence of Health Problems, and the Likelihood of Referral

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ABSTRACT

Objective: *This study explores the associations among the timing of post-deployment screening, the apparent prevalence of health problems, and the likelihood of referral for further care. In addition, it explores participant preferences for the timing of enhanced post-deployment screening.* ***Background:*** *Better post-deployment screening has been proposed as an important strategy to decrease the burden of deployment-related health problems. The optimal timing of such screening is uncertain: If done immediately upon return, few members endorse health concerns, perhaps because of a "honeymoon" effect in which homecoming is seen as the solution to any and all problems. Once the "honeymoon" period is over, screening too soon risks over-identification and labelling of those with self-limited problems, while screening too late risks missing an opportunity to intervene early and prevent complications. Using data collected during the evaluation of a new, enhanced post-deployment screening process, this study explores the optimal timing in two ways: First, it explores, in a naturalistic fashion, the association of different timings with the apparent prevalence of health problems and with the likelihood of referral for further care. Second, it explores participant preferences with respect to timing, as expressed on an anonymous evaluation form.* ***Methods:*** *Approximately four to six months after return from Afghanistan in 2001 - 2002, Canadian Forces (CF) members from all three branches (Land, Sea, and Air) were required to complete the SF-36 Health Survey, most of the PRIME-MD Patient Health Questionnaire (PHQ), and a shortened version of the Mississippi Scale for Combat-related PTSD. The survey results were entered into a Microsoft Excel spreadsheet that generated a customized report with an interpretation of the instruments. This report was reviewed by a mental health professional, who then administered a 40-minute semi-structured interview covering a broad range of areas of biopsychosocial well-being. The interviewer recorded his or her potential concerns about a variety of physical, mental, and social health issues and made recommendations for further evaluation or care, if indicated. Those interviewed were offered the opportunity to complete an anonymous evaluation form and to consent to the anonymous use of their data for research purposes.* ***Results:*** *2,528 out of 4,140 eligible members (61%) consented to research use of their survey and interview data; of these, 2,053 (81%) had usable information on the timing of the screening relative to return from deployment. This sample was 92%*

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male with an average age of 35 years and an average number of previous deployments of 3.3. For logistical reasons, the lag time from return from deployment to screening varied, taking place prior to 120 days of return in 488 (23.8%) participants, between 120 and 180 days after return in 344 (16.8%), and more than 180 days after return in the remaining 1221 (59.5%). One or more mental or physical health problems were identified on the PHQ or Mississippi Scale in 1011 participants (53.9%), and some sort of follow-up was recommended in 384 (18.7%). Those whose lag time to screening was in the first quartile (approximately 121 days or less) were slightly more likely to have at least one problem identified on their questionnaire (57.8% vs. 52.7%, univariate OR = 1.2 [95% CI 1.0 – 1.5], p=0.058) but were substantially more likely to have some sort of follow-up recommended (29.8% vs. 15.1%, OR=2.4 [95% CI 1.9 – 3.0, p<0.001]. Shorter lag time was associated with a higher likelihood of referral even in those without any problem identified on their questionnaire (univariate OR = 2.0 [95% CI 1.2 – 3.6], p<0.001). Evaluation forms were returned by 1,643 out of the first ~2,000 participants (~82%). 76% indicated that some additional post-deployment screening should "definitely" or "probably" be offered in addition to the conventional immediate post-deployment medical examination. Of these, 77% thought it should be mandatory. 49% thought the additional screening should take place within three months after return, and 44% thought it should occur between three and six months after return. ***Conclusions:*** *Those screened within 120 days of return were substantially more likely to receive a recommendation for follow-up care whether or not they had identified health problems on their screening questionnaires. Service members expressed substantial support for additional post-deployment screening; approximately ½ desired the screening within two months of return. Performing enhanced post-deployment screening at the preferred time for service members would likely result in a substantially higher level of referrals; these referrals may be for self-limited or non-diagnostic conditions, or they may be for clinically important conditions that were not detected on by the questionnaires. Other data suggests that the former explanation is more likely.*

1.0 BACKGROUND AND INTRODUCTION

Military deployments can be associated with increased rates of long-lasting mental distress and mental illness[1]. Post-traumatic stress disorder (PTSD)[2-4], depression[5;6], and alcohol abuse[2;7], have been well-studied, and there is also evidence that generalized anxiety disorder[8] and panic disorder[8] may be deployment-related.

Deployment can also be associated with higher levels of medically unexplained physical symptoms including musculoskeletal pain, cognitive dysfunction, sleep disturbance, and digestive complaints[9;10]. More than one-third of Gulf War veterans suffer from such symptoms, and there is much historical evidence that these problems are not new or limited to that conflict[11;12].

Improved post-deployment screening has been proposed to more quickly identify and treat individuals suffering from deployment-related illnesses, particularly mental health problems[13]. Quick treatment may truncate the period of their suffering and may mitigate the personal, family, social and occupational consequences of untreated illness. While data from post-deployment context is limited, there is evidence that screening for depression[14], high-risk drinking[14], and medically unexplained physical symptoms[15] is beneficial in the primary care setting. Recently, it has been shown that screening and early implementation of multi-disciplinary care for PTSD in patients hospitalized for major trauma improved outcomes related to both PTSD and problem drinking[16]. Post-deployment screening also might have administrative[9] and epidemiological value[17]. Enthusiasm for deployment-related screening appears to be increasing, particularly in the US where returning service members are now screened twice: once within days of their return and again three to six months following their return. A number of individuals and groups have argued

that deployment-related screening is logistically difficult, poorly accepted by members, subject to strong symptom reporting biases, and reliant upon instruments that have not been validated in the pre- and post-deployment contexts[9;18-20]. Despite its common sense appeal, it is fair to say that intensive post-deployment screening has never been rigorously shown to be superior to "usual" post-deployment care. This uncertainty has reasonably led to the criticism that such screening may be wasteful or even harmful[20].

These controversies taken aside, surprisingly little is known about the optimal timing of post-deployment screening. It is clear that the process of deployment, re-deployment, and reintegration into life in garrison is a time of rapid emotional flux[21], implying that the apparent prevalence of mental health problems and the likelihood of referral are likely dependent on the timing of the screening.

Anecdotally, most returning service members experience a sense of euphoria and relief around the time of their return. They may also be reluctant to disclose problems at that time out of fear that such disclosure might delay their reunion with their friends and family. And many may believe, perhaps correctly, that whatever problems they are having will abate once they settle in back home. Accordingly, screening too early will miss many members who will later prove to have deployment-related mental health problems. Indeed, the US has noted that the prevalence of self-disclosed problems was much lower during the immediate post-deployment period (3 to 5%) than at 3 to 6 months after return (30%)[22]. Again anecdotally, re-deploying service members often then go through a period of low or depressed mood in the first few weeks following their return. Screening during that period risks over-identifying and labelling a large number of individuals who are experiencing a normal process of readjustment. At some point, perhaps typically 4 months after return from a "routine" tour, returning Canadian Forces service members feel as though they have fully re-adjusted to life in garrison[21]. Similarly, the relatively well-characterized time course of post-traumatic stress symptoms suggests that most spontaneous recovery will occur in the first 3 to 6 months after the traumatic event; thereafter symptoms tend to be more chronic. Accordingly, screening too late would result in both a lost opportunity to reduce suffering and to intervene before the "loss spiral"[23] of PTSD or other mental illnesses progressively erodes the chances of full recovery.

Hard data corroborating and quantifying these impressions are scarce: There have been very few published longitudinal studies of re-deploying service members. One study of 377 returning peacekeepers did show that stress levels and other measures of well-being did indeed fluctuate substantially throughout the deployment cycle[24]. Intriguingly, different attributes of stress, mental health, and physical health followed very different temporal patterns. Unfortunately, this study did not provide any data on the time course of problems beyond 6 months after return. In contrast, a longitudinal study of distress in 316 Swedish peacekeepers showed that the prevalence of distress did not vary significantly from pre-deployment through one year following re-deployment[25].

Accordingly, this study focuses on two aspects of the timing of post-deployment screening: First, it explores, in a naturalistic fashion, the relationship between the timing of screening and both the prevalence of apparent health problems and the likelihood of referral for further evaluation in Canadian Forces (CF) members undergoing Enhanced Post-deployment Screening. Second, it describes the preferences of returning service members with respect to the timing of the screening, as expressed on a participant evaluation form completed at the time this screening.

1.1 The Canadian Forces Operation APOLLO Experience

The Land, Sea, and Air components all contributed to Op APOLLO.

1.1.1 The Maritime Contribution

CF maritime units from both Canadian Forces Base (CFB) Halifax and CFB Esquimalt provided Canada's first response to the events of September 11 during Op APOLLO. HMCS HALIFAX and VANCOUVER were redeployed from their initial missions, and HMCS IROQUOIS, CHARLOTTETOWN, and PRESERVER deployed with 10 days notice. The stresses of such a short lead-time were compounded by an indeterminate mission end-date and heightened force protection measures against both conventional and biological terrorist threats. Once the Canadian Task Group arrived in the Arabian Sea it assumed escort duties for aircraft carrier and USMC amphibious ready groups and patrolled potential maritime escape routes from Afghanistan with the goal of interdicting Taliban or Al Qaeda leadership.

Naval boarding party personnel were involved in ship inspections for suspected terrorists—a physically and mentally exhausting task. Ship's combat departments were kept in continuous 1 and 2 watch rotations with little opportunity for sunlight or rest. Engineering and supply personnel were kept extremely busy with maintaining the Task Group's combat effectiveness at sea, while air detachments put in many hours of dedicated labour resulting in a very successful mission-completion rate for the Sea King helicopters.

Life on board ship is characterized by crowding, lack of privacy, extreme temperatures, and noise, all of which take their toll on the crew over time. The concurrent heightened level of tension between India and Pakistan and the potential threat of being attacked as was the USS Cole in Yemen were often-quoted sources of concern, while high temperatures and highly demanding work program affected crews as a whole. Sailors and maritime helicopter personnel spent more continuous days at sea than at any other time since the Korean War, with port visits for repair and re-supply often months apart. This change in naval operations, coupled with the increased vigilance mandated by force protection and mission requirements, tested the reserves of all personnel deployed at sea.

1.1.2 The Air Force Contribution

The National Support Unit (NSU) deployed to the Gulf consisted of several hundred, primarily air force, support personnel. The principal bases contributing members included CFB Trenton, Greenwood, Winnipeg, and Shearwater. The NSU's role was to provide administrative, logistical and medical support as well as coordination functions to the Army, Navy, and Air force elements deployed in the region as part of Op Apollo. The NSU was co-located with the CF air elements (CC130 Hercules transport and CP-140 maritime patrol aircraft) deployed to the region. Personnel were physically located on a small host nation airbase in the middle of the desert, approximately 50 km from a large, modern city, which offered many western conveniences. The threat of terrorist attack, while real, was not perceived as a major source of stress.

CF members in the NSU were housed in large, temporary aluminium trailer facilities having a capacity of approximately 40 people, living two per room. Each trailer had adequate, clean toilet facilities. Comfortable dining and recreation facilities were available. Most of the support trades were fortunate enough to be able to work in air-conditioned spaces most of the day. However, certain trades such as aircraft and vehicle maintainers, military police, construction engineers, and others would frequently be required to work outside in extreme temperatures. Because of the proximity to the airfield, high noise levels were a constant annoyance.

1.1.3 The Land Force Contribution

The Princess Patricia's Canadian Light Infantry (PPCLI) Battle Group consisted of about 900 men and women. Most belonged to the PPCLI 3rd Battalion (3PPCLI) and related units based at CFB Edmonton, with

a sizable contribution from 2PPCLI (based at CFB Winnipeg). The Battle Group was under the operational control of the US 187th Brigade, and its mission was to assist in all aspects of combat operations. Key activities included perimeter security, combat missions, reconnaissance and other patrols, and QRF (Quick Reaction Force) response activities. Over the duration of the deployment the Battle Group did three major missions (Op Harpoon/Anaconda, Op Torii, and Op Cherokee Sky) and many other small ones. Missions and tasks involved a broad range of activities, including, direct combat (particularly sniping), security operations, provision of humanitarian aid, intelligence gathering, exploration and destruction of cave complexes suspected of harbouring enemy combatants, and, for one party, exhuming human remains for forensic purposes.

The Battle Group was based out of Khandehar Airfield, but its members were often in other areas of the country, sometimes for as long as a month at a time. The airfield was approximately 6 to10 square kilometres and housed approximately 5000 (principally US) soldiers along with the prison for suspected Al Qaeda operatives. The Canadian camp was approximately 600 to 800 metres square. Land was at a premium, as it had to be de-mined prior to use. Accommodations and living conditions were very primitive. Lodging consisted of living in a two-man tent. Initially, there were no shower facilities, and toilet facilities consisted of multi-hole privies; human waste was collected in drums and burned regularly with the aid of diesel fuel. Water was very scarce initially, but became more plentiful as the deployment progressed. Meals consisted of rations for two meals a day and a single kitchen-prepared meal daily. Challenging hygiene conditions resulted in frequent episodes of gastrointestinal illnesses. There was little contact with family members back home until a satellite phone arrived 6 or 8 weeks into the rotation.

The environmental conditions were also challenging. Temperatures at the beginning of the rotation in February were -5º to -10º Celsius at night and 20º to 30º Celsius during the day. Temperatures gradually increased during the deployment, and at the end of the rotation in July, daytime high temperatures reached 50º to 60º Celsius. The proximity to the airfield resulted in high levels of noise, day and night. Vegetation was limited in most areas, and shade was often difficult to find. Some missions occurred at altitudes of up to 3000 metres. Pervasive dust was a constant nuisance, as were snakes, spiders, and other vermin. Away missions were also physically because they often involved carrying packs and equipment weighing up to 75 kg.

Military threats were numerous. Mines and unexploded ordinance were both ubiquitous; rocket attacks occurred from time to time in some locations. Explosions were heard frequently, as combat engineers destroyed ordinance. Contact with the locals usually turned out positively, but ambushes or terrorist attacks were a constant threat. Most significantly, four CF members lost their lives and a several others were seriously injured in the friendly fire accident in which a US plane mistakenly dropped a 500-pound bomb on members of the battle group who were participating in a live-fire exercise at Tarnak Farm, near Khandehar airfield.

2.0 METHODS:

2.1 Screening Protocol

All Op APOLLO participants were required to undergo Enhanced Post-deployment Screening; those who were in theatre briefly for a Technical Assistance Visit or those who were not deployed to SW Asia or the Persian/Arabian Gulf were excluded. The process consisted of the completion of health questionnaire followed by an in-depth interview with a mental health professional.

2.1.1 Questionnaires

Participants first completed 3 standardized health questionnaires, the SF-36 Health Survey (Version 1)[26], an abbreviated version of the PRIME-MD Patient Health Questionnaire (PHQ)[27], and a abbreviated version of the Mississippi Scale for Combat-related PTSD[28].

The SF-36 is one of the most widely used and best validated measures of general health status.[26] It yields 8 scale scores reflecting 8 different domains of physical and mental health. These scale scores can be collapsed into a physical component summary score and a mental component summary score.[29] The SF-36 has a strong functional emphasis and correlates well with other functional status measures.[26;29]

The PHQ was designed for screening for common mental illnesses in patients in primary care clinics[27;30]. It assesses physical symptoms, psychosocial stressors, and some common physical and mental health symptoms (principally those of depression, panic, generalized anxiety, and alcohol misuse). Segments of the original PHQ that deal with eating disorders and reproductive health were not administered.

Standardized scoring algorithms can be applied to the PHQ to generate surrogate diagnoses of Major Depressive Syndrome, Other (Minor) Depressive Syndrome, Panic Syndrome, Other (Generalized) Anxiety Syndrome, and Alcohol Abuse Syndrome; these surrogate diagnoses correlate well with diagnoses ultimately generated by mental health clinicians[27]. A 15-item physical symptom scale ("PHQ-15") derived from the PHQ has been described; this scale includes the 13 physical symptoms from the first question of the PHQ plus two additional items on fatigue and sleep disturbance derived from the PHQ questions on depression[31]. Because the response categories on these two items is different from those used for the 13 physical symptoms, they were recoded so that "more than half the days" and "nearly every day" corresponded to the "bothered a lot" category used for the other physical symptoms[31].

The Mississippi Scale is one of the most widely used instruments for measuring combat-related PTSD symptoms[28]. The original scale has 35 questions, and abbreviated versions using fewer questions have been reported[32;33]. The CF Operational Trauma and Stress Support Centres have used an 11-item subset of the Mississippi scale, using the 10-item screen characterized by Hyer *et al*[33] plus one additional question (item 12 of the original scale). This scale ("Miss-11") results in a numerical score ranging from 11 to 55; a cut-off of 25 or greater was found to distinguish between CF members with deployment-related PTSD and healthy post-deployment members with a sensitivity of 91% and a specificity of 97%[34].

The completion of the questionnaire took about 20 minutes, and the results were then analyzed using a Microsoft Excel spreadsheet template that yielded a report with the 8 SF-36 scale scores, a breakdown of physical symptoms and psychosocial stressors from the PHQ, and whether the respondent met criteria for mental illness on the basis of the PHQ[27] the Miss-11.

2.1.2 Interview with a Mental Health Professional

The report was provided to a mental health professional, who then administered a semi-structured interview lasting approximately 40 minutes. The interview questions were divided between those on individual mental health issues and those on family/social function and adaptation. In most cases, the interviewer was a social worker or a mental health nurse; virtually all screening staff received at least 3 hours of instruction on common deployment-related health problems and on the interpretation of the questionnaire. All participants completed the interview, regardless of the results of the questionnaire. Interviews typically occurred within three weeks of completion of the questionnaire. Some bases used contracted employees for these interviews; others relied on their existing uniformed and civilian staff.

After the interview, interviewer completed a single page "Disposition Form," which listed their concerns (indicating whether the concern was "major" or "minor") and made recommendations for further follow-up care. Interviewers did not suggest or make diagnoses, but rather indicated concerns in particular areas and suggested referral for further evaluation of these concerns by an appropriate clinician. Members were given an anonymous evaluation form at the end of the interview.

2.2 Data Entry and Analysis:

The anonymous participant evaluations forms and anonymized copies of the questionnaires and the disposition forms were delivered to the Deployment Health Section for coding, data entry, and analysis. Data were coded and entered by a professional data processing firm using 100% verification. Statistical analysis was done using SPSS for Windows, Version 11.5[35]; statistical independence was tested using the χ^2 test. Difference in means were tested using independent sample t-test or univariate analysis of variance (ANOVA). Lag time from return from deployment to completion of the questionnaires was analyzed in quartiles.

2.3 Primary and Secondary Outcome Variables

The primary and secondary outcomes variables were as follows:

- Fraction of participants screened receiving recommendation for follow-up care;
- SF-36 Physical Component Summary (PCS) and Mental Component Summary (MCS) Scores;
- Prevalence of "any mental health problem," to include Major Depressive Syndrome, Other (Minor) Depressive Syndrome, suicidal ideation, Panic Syndrome, Other (Generalized) Anxiety Syndrome, and PTSD as determined by the PHQ and the Miss-11;
- Prevalence of "any mental health and alcohol problem), including the above plus Alcohol Abuse Syndrome, as determined by the PHQ;
- Prevalence of "any problem," including the above plus those "bothered a lot" by one or more physical symptoms or psychosocial stressors from the PHQ; and
- Member preferences for the timing of screening as expressed on their evaluation forms.

2.4 Ethical Aspects

The consent procedure and the research protocol were approved by Ethica Clinical Research (Dorval, Québec), an independent Research Ethics Board that conforms to Canadian standards for the ethical conduct of research involving humans[36].

3.0 RESULTS

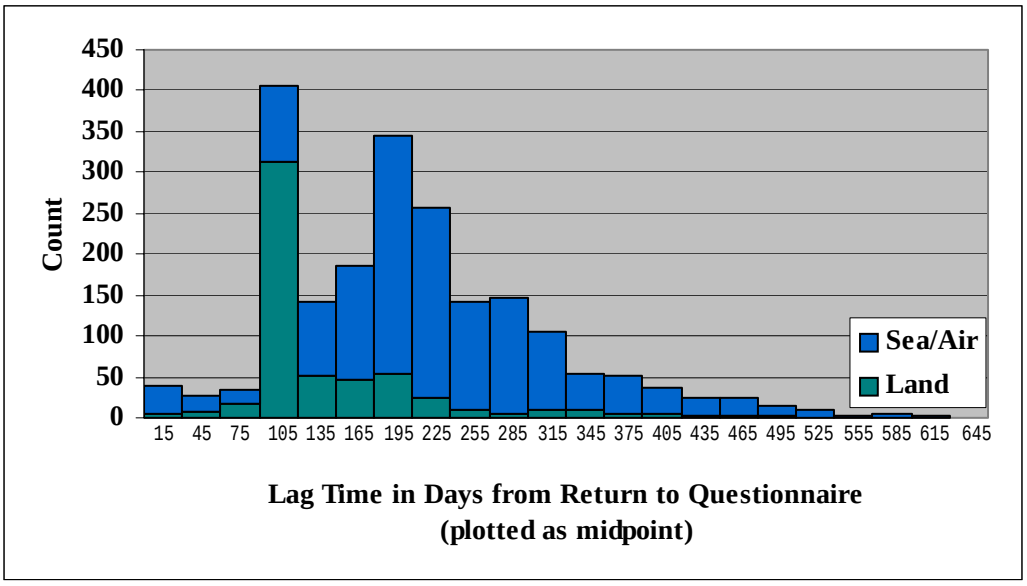
3.1 Sample Characterization

The Canadian Force's Tasking Database indicated that 4,140 Op APOLLO deployees with return dates prior to 1 January 2003 were eligible for the enhanced post-deployment screening. Members who did not deploy to SW Asia and members who were in theatre only briefly on "Technical Assistant Visits" (approximately 258 members) were excluded. Of those eligible, at least 90% underwent the enhanced screening, and of these, 2,528 (61% of those eligible) consented to the research use of their data. 1,643 of the first approximately 2,000 members screened (~82%) completed anonymous evaluation forms.

Information on the date of deployment and the date of survey completion were available for 2,053 of those interviewed (81%). Since this information is needed to calculate the timing of post-deployment screening relative the return date, the analyses below involving the timing of screening are limited to this subsample. As reflected in the histogram (**Figure 1**), interviews occurred at a mean of 208 days (median = 190 days) and a standard deviation of 100 months (interquartile range: 121 – 262 days) after return from deployment. Approximately 80% of those in the first quartile were screened between 90 and 120 days after return. As it happened, those screened early were disproportionately in the Land Forces (X out of Y, %), which had had substantially more traumatic exposure than those in the

Figure 1

Histogram of Lag Time from Return from Deployment to Questionnaire Completion: Land Forces vs. Sea/Air



For logistical reasons, relatively few members 344 (16.8%) were screened during the target period of between 120 and 160 days after redeployment; 488 (23.8%) were screened before and 1221 (59.5%) were screened after the target period. Members had the option of bringing their spouse/partner/significant other with them to the interview, but in practice only 94 (5.4%) did so. The demographic characteristics of the sample are shown in **Table 1**; analysis of non-respondents is ongoing, but preliminary analysis suggests that demographic and military characteristics of the sample are largely similar to the population of Op APOLLO participants as a whole.

3.2 Interviewer's Recommendations for Further Follow-up Care

Overall, 384 (18.7%) of those in this sample received a recommendation for further follow-up care at the end of the screening process. Of these, the interviewers had "major" physical health concerns only in 48 (12.5%), "major" psychosocial concerns only in 155 (40.4%), and both "major" physical health and psychosocial

concerns in 35 (9.1%); the remaining 164 (42.7%) had either "minor" concerns only or no concerns at all identified. As shown in **Figure 2**, there was a strong, univariate association ($p<0.0001$ by χ^2 test) between lag time quartile and a recommendation for further follow-up care, with those in the first lag time quartile (121 days or less) having a higher rate of recommendation for follow-up.

Table 1

Demographic and Military Characteristics of Participants (N=2,053)

Characteristic	Participants N*	(%)**	Characteristic	Participants N*	(%)**
Gender			Duty status		
Male	1875	(91.6)	Regular force	2007	(99.2)
Female	173	(8.4)	Reserves	17	(0.8)
Age (years)			Branch of service		
≤ 24	177	(8.8)	Land	577	(28.2)
25 – 34	862	(42.7)	Sea	1077	(52.7)
35 – 44	841	(41.6)	Air	390	(19.0)
45 – 54	141	(7.0)	Years in military		
Marital status			≤ 5	337	(16.4)
Married or living with partner	1346	(66.1)	6 – 10	376	(18.3)
Single (never married)	468	(23.0)	11 – 15	534	(26.0)
Divorced/Separated/Widowed	221	(10.9)	16 – 20	409	(19.9)
Educational Attainment			> 20	395	(19.3)
No university degree	1798	(88.2)	Number of previous deployments		
University degree	245	(11.8)	None	346	(16.9)
Rank			1 to 2	721	(35.2)
Commissioned Officer	265	(15.4)	3 to 4	405	(19.7)
Other	1456	(84.6)	5 or more	579	(28.2)

*Totals might differ slightly due to missing data.
**Totals might not add up to 100% due to rounding.

3.3 Questionnaire Results

SF-36 scores by lag time from return from deployment to questionnaire completion are shown in **Table 2.** Univariate ANOVA shows no statistically significant difference in either the PCS or MCS scores in the different lag time quartiles. The prevalence of different conditions identified on the PHQ and the Miss-11 varied substantially, with physical symptoms being the most prevalent problem and Panic Syndrome being the least prevalent problem. Only Alcohol Abuse Syndrome and PTSD were associated with lag time quartile, with the first and last quartiles appearing to have higher prevalence rates of these conditions than the middle two quartiles.

These questionnaire results are summarized and explored graphically in **Figure 3.** A statistically significant relationship is seen between lag time quartile and "Any problem" ($p=0.036$ by χ^2 test) and "Any mental health or alcohol problem" ($p<0.001$), but not "Any mental health problem" ($p=0.108$). The differences were not, however, dramatic. Similar marginal differences were seen when the first quartile was compared with the second through fourth quartiles (**Table 4**). There was no statistically significant difference in the mean SF-36 PCS scores in the first vs. second through fourth quartiles (mean difference = -0.22. 95% CI: -1.21, 0.78, p =

0.667). In contrast, mean SF-36 MCS scores were significantly lower in the first quartile than the second through fourth quartiles (mean difference = -1.61, 95% CI: -2.79, -.042, p = 0.008).

3.4 Stratification of Association of Lag Time and Follow-up Recommendation by Questionnaire Results

The finding of a substantially higher rate of recommendation for follow-up for those screened prior to 120 days was somewhat unexpected in and of itself; it is particularly surprising given the minimal relationship between lag time and the questionnaire results. This was explored further by stratifying the follow-up care recommendation results by the questionnaire results, focusing on the differences between the first vs. second through fourth lag time quartiles (**Table 5**). This analysis confirms that those who were screened during the first quartile were substantially more likely to have received a recommendation for follow-up, *whether or not they had any specific problems identified on the questionnaires.*

3.5 Participant Preferences for Post-deployment Screening

The anonymous participant evaluation form (N=1,643) explored preferences for post-deployment screening. With respect to the need for additional post-deployment screening beyond the immediate post-deployment medical examination, 46% felt that additional screening should "definitely" take place; an additional 30% felt it "probably" should take place. Of these, 77% felt such screening should be mandatory.

With respect to the timing of additional post-deployment screening, 49% thought it should occur prior within 2 months of return from deployment, while 44% thought it should occur between 3 to 6 months of return.

Figure 2

Fraction of Participants Receiving a Recommendation for Further Follow-up Care by Lag Time to Questionnaire

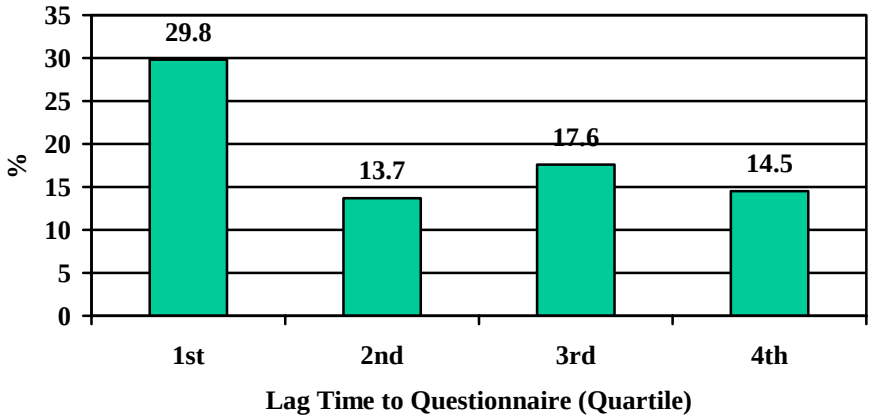


Figure 3

Prevalence of Problems Detected by Questionnaires by Lag Time to Questionnaire

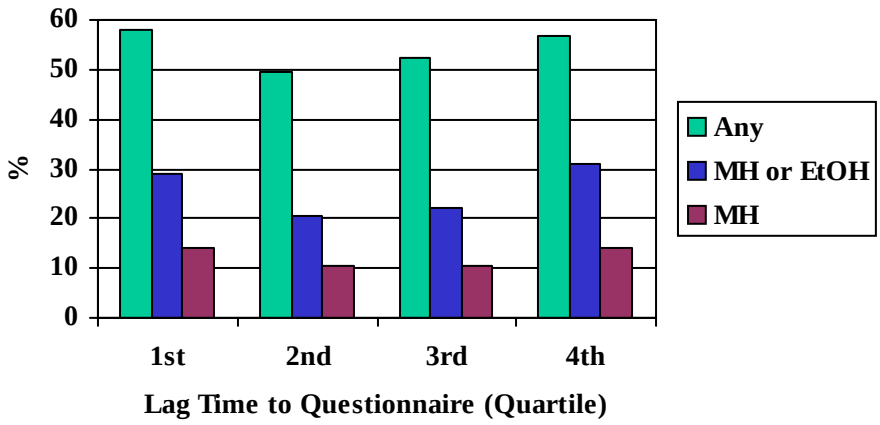


Figure 3: "MH" = Any of Major Depressive Syndrome, Other Depressive Syndrome, any suicidal ideation, Panic Syndrome, Other Anxiety Syndrome, or PTSD; "MH or EtOH" = Any of the preceding or Alcohol Abuse Syndrome; "Any" = Any of the preceding plus "bothered a lot" by one or more physical symptoms or psychosocial stressors.

Table 2

Association of Lag Time to Questionnaire and SF-36 Physical and Mental Component Summary Scores

	Overall		Lag Time from Return from Deployment to Questionnaire Completion (Quartile)								
			1st		2nd		3rd		4th		
	Mean	SD*	Mean	SD*	Mean	SD*	Mean	SD*	Mean	SD*	p value**
Physical Component Summary Score (PCS)	48.6	9.8	48.5	10.0	49.3	9.3	48.2	9.7	48.4	10.2	0.230
Mental Component Summary Score (MCS)	48.3	11.7	47.0	11.6	48.8	11.7	48.5	11.8	48.6	11.7	0.064

*Standard deviation
** By analysis of variance (ANOVA)

Table 3

Association of Lag Time to Questionnaire and Prevalence of Problems Reported on Questionnaire

	Overall		Lag Time from Return from Deployment to Questionnaire Completion (Quartile)								
			1st		2nd		3rd		4th		
	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	p value††
"Bothered a lot" by at least one 15 physical symptoms	778/1996	39.0	215/496	43.3	202/546	37.0	176/460	38.3	185/494	37.4	0.141
"Bothered a lot" by at least one of 10 psychosocial stressors	439/1995	22.0	104/492	21.1	119/557	21.4	104/461	22.6	112/485	23.1	0.858
Major depressive syndrome	78/1928	3.9	14/500	2.8	21/551	3.8	19/160	4.1	24/496	3.9	0.413
Other depressive syndrome	77/2007	3.8	25/500	5.0	17/551	3.1	18/460	3.9	17/496	3.4	0.406
Suicidal ideation	57/2018	2.8	19/501	3.8	12/560	2.1	9/458	2.0	17/499	3.4	0.212
Panic syndrome	28/2015	1.4	8/502	1.6	8/557	1.4	4/459	0.9	8/497	1.6	0.744
Other anxiety syndrome	45/1928	2.3	10/490	2.0	13/548	2.4	8/452	1.8	14/438	3.2	0.523
Alcohol abuse syndrome	290/1859	15.6	83/461	18.0	61/509	12.0	57/431	13.2	89/458	19.4	0.003
PTSD	108/2020	5.3	34/499	6.8	24/561	4.3	16/464	3.4	34/462	6.9	0.030
Any mental health problem*	1011/1874	53.9	268/464	57.8	255/514	49.6	230/441	52.2	258/455	56.7	0.036
Any mental health or alcohol problem**	469/1833	25.6	132/456	28.9	104/502	20.7	94/427	22.0	139/448	31.0	<0.001
Any problem†	233/1903	12.2	69/486	14.2	56/538	10.4	47/447	10.5	61/432	14.1	0.108

*Any of Major Depressive Syndrome, Other Depressive Syndrome, any suicidal ideation, Panic Syndrome, Other Anxiety Syndrome, or PTSD

**Any of the above or Alcohol Abuse Syndrome

†Any of the above plus "bothered a lot" by one or more physical symptoms or psychosocial stressors

††By χ^2 test (univariate)

Table 4

Questionnaire Results and Lag Time (1st vs. 2nd – 4th Quartiles)

	Lag Time Quartile				Univariate Odds Ratio		
	1st Quartile		2nd – 4th Quartiles				
Group	n/N	%	n/N	%	OR	95% CI	p value††
Any mental health problem*	69/486	14.2	134/1417	11.6	1.3	0.9 – 1.7	0.128
Any mental health or alcohol problem**	132/456	28.9	337/1377	24.5	1.3	1.0 – 1.6	0.058
Any problem†	268/464	57.8	743/1410	52.7	1.2	1.0 – 1.5	0.058

*Any of Major Depressive Syndrome, Other Depressive Syndrome, any suicidal ideation, Panic Syndrome, Other Anxiety Syndrome, or PTSD

**Any of the above or Alcohol Abuse Syndrome

†Any of the above plus "bothered a lot" by one or more physical symptoms or psychosocial stressors

††By χ^2 test (univariate)

Table 5

Recommendation for Further Follow-up Care and Lag Time Quartile: Stratification by Questionnaire Results

	Lag Time Quartile				Univariate Odds Ratio		
	1st Quartile		2nd – 4th Quartiles				
Group	n/N	%	n/N	%	OR	95% CI	p value††
All	150/503	29.8	234/1547	15.1	2.4	1.9 – 3.0	<0.0001
Any mental health problem*							
Yes	48/69	69.6	75/163	46.0	2.6	1.5 – 4.9	0.0010
No	97/416	23.3	137/1252	10.9	2.5	1.9 – 3.3	<0.0001
Any mental health or alcohol problem**							
Yes	70/132	53.0	102/336	30.4	2.6	1.7 – 3.9	<0.0001
No	65/323	20.1	102/1040	9.8	2.3	1.7 – 3.3	<0.0001
Any problem†							
Yes	121/267	45.3	178/741	24.0	2.6	2.0 – 3.5	<0.0001
No	21/175	10.7	37/630	5.5	2.0	1.2 – 3.6	0.0111

*Any of Major Depressive Syndrome, Other Depressive Syndrome, any suicidal ideation, Panic Syndrome, Other Anxiety Syndrome, or PTSD

**Any of the above or Alcohol Abuse Syndrome

†Any of the above plus "bothered a lot" by one or more physical symptoms or psychosocial stressors

††By χ^2 test (univariate)

4.0 DISCUSSION

4.1 Summary of Key Findings

Participants in our Enhanced Post-deployment Screening Process were substantially more likely to have received a recommendation for follow-up care if they were screened 121 days after return from deployment or sooner. SF-36 Physical Component Summary scores were not related to lag time to screening, but Mental Component Summary scores were slightly lower in the first vs. second through fourth quartile. Of the specific problems covered by the questionnaires, only alcohol abuse and PTSD symptoms were weakly associated with lag time. Curiously, those screened 121 days or earlier were substantially more likely to have follow-up recommended whether or not they had problems identified on the questionnaires. Participant evaluations showed surprisingly strong support for additional post-deployment screening, though the preference was to have such screening done within two months following return from deployment.

4.2 Comparison with Other Findings

There is a relatively little published data on the association of the timing of post-deployment screening and the prevalence of health problems and the likelihood of recommendation for follow-up care. The US experience with immediate (within 5 days of re-deployment) and delayed (3 to 6 months after return) deployment screening showed that dramatically fewer participants endorsed concerns during the immediate post-deployment period[22]. This is consistent with an immediate post-deployment "honeymoon effect." There is no published data that explores the prevalence of health problems or recommendations for follow-up in the 90 to 120 days vs. more than 120 days period that roughly reflects the first vs. second through fourth quartiles represented in this paper. This is however consistent with qualitative data that suggest that it takes 4 months for CF members to return to baseline after a routine deployment[21]. The reason for the slightly higher apparent prevalence of both alcohol abuse and PTSD symptoms in the last screening quartile is not clear; confounding is a possible explanation.

4.3 Limitations

The principal limitations of this analysis stem from the observational nature of the dataset and the univariate nature of this analysis. The timing of the screening was determined by logistical and other factors, and it is clear that those screened during the first quartile were different from those screened later. In particular, Land Forces members deployed on a combat mission to Khandehar in 2002 were disproportionately represented in the first quartile. As mentioned in the introduction, this group had a challenging deployment for a number of reasons. The higher apparent prevalence of PTSD symptoms seen in the first quartile may be due to the higher prevalence of traumatic experiences in this cohort. Nevertheless, the only minimally higher prevalence of problems reported on the questionnaire and the fact that even those who did *not* report problems on the questionnaire had a substantially higher referral rate during the first quartile suggests that the tendency to refer was being driven by factors other than the questionnaire results.

Our data was limited to lag times ranging from approximately 90 to 365 days after return from deployment; we cannot infer much about the likely outcomes of screening prior to or after that period.

While the instruments used have been previously validated, none were specifically validated for post-deployment screening, and there may be contextual factors that affect the performance characteristics of the instruments in the post-deployment period[20]. The validation of the short version of the Mississippi Scale we used was limited, casting some uncertainty as to what this scale is measuring. In particular, it is not clear

whether it can distinguish effectively between CF members with PTSD and those with other mental illnesses; indeed, most of the items in the scale are not specific to PTSD[33].

Only ~61% of those who were eligible for the interview consented to analysis of their data. Of these, the lag time to interview was available in only 81%. This may have introduced response bias, though preliminary non-respondent analysis does not suggest any major demographic differences between respondents and the Op APOLLO cohort as a whole. It is possible that those who had had problems identified during the screening would have been less likely to consent to the anonymous use of their data.

There is evidence that service members have concerns about divulging mental health problems, particularly PTSD[37]; these concerns could have led theoretically to underreporting of these problems on our non-anonymous questionnaires. However, other recent research from the US has shown that anonymity of reporting had little or not effect on the prevalence of reported problems (including PTSD), and those with more severe problems were *least* likely to under-report symptoms[38]. Still, it is conceivable that those screened during the first lag time quartile (who were probably at highest risk for deployment-related mental health problems because of their deployment experiences) were reluctant to report their symptoms in writing on the questionnaire but were willing to do so during the interview; this could account for the higher referral rate for those screened in the first quartile.

The absence of a gold-standard diagnosis for the participants in this screening process makes it difficult to interpret the mismatch between the questionnaire results and the recommendation for follow-up seen in the first quartile: Were the interviewers picking up clinically relevant conditions that had been missed by the survey instruments? Or were they inappropriately referring those who were well or those with self-limited adjustment issues? We offer several lines of evidence that are more supportive of the latter interpretation.

First, the questionnaire results themselves are relatively compelling. The conditions addressed by the PHQ and Miss-11 reflect the conditions most likely to be of interest in the population screened. One would have to argue that the sensitivity or specificity of the instruments was markedly different in the first quartile or that there were much large numbers of individuals with clinically significant problems not covered by the PHQ or Miss-11 among those screened in the first quartile. Neither of these explanations seems terribly likely.

Second, the lack of impressive differences in SF-36 scores across quartiles suggests that the prevalence and severity of health problems were, in general, similar. The only statistically significant difference was in the Mental Component Summary score and only if analyzed using the first vs. second through fourth quartiles. While the magnitude of the difference might be clinically significant[29], this small difference seems unlikely to account for the marked difference in the referral rate. The mismatch between the results of the SF-36 MCS and the other questionnaires may be accounted for a higher level of general distress (but not of diagnosable mental illness) in those screened during the first quartile.

Finally, informal discussion with the clinical staff receiving referrals at the base doing most of the screening during the first quartile of lag time suggests that a large fraction of referrals were for distressed but not ill individuals (confirming the questionnaire findings). Unfortunately, we have no way of substantiating or quantifying this.

4.4 Implications

What then might account for the higher referral rate among those in the first quartile? We are concerned that the nature of the deployment experiences of those screened during the first quartile (largely the PPCLI Battle

Group that suffered the friendly fire casualties and other traumatic events) may have created an expectation of illness in the eyes of the interviewers: Perhaps interviewers told themselves implicitly: "Having experienced what you have, you must be ill." While some have argued that increased deployment-related screening may create an expectation of illness on the part of the service members themselves, our data suggest that the problem may lie with the clinicians instead.

Further analysis in the form of logistic regression modelling will help confirm the finding of a higher referral rate for those in the first quartile for lag time to screening. Unfortunately, there will be some unavoidable multicollinearity and power issues that will erode the value of this. Assuming that the relationship persists, presenting this data to the screening staff for interpretation and feedback will help clarify why participants who reported no problems on the questionnaires were referred for follow-up care. We assumed that the experienced mental health professionals performing the screening would be able to effectively distinguish between diagnosable mental illness and normal distress associated with re-intergration into family and garrison life. Our data raises the possibility that that is not the case, so more training on this important topic (which is the central challenge of post-deployment screening) may be in order.

Further studies on the associations among the timing of post-deployment screening, the prevalence of health problems, and the likelihood of referral for further care should have several key features:

- Randomization with respect to the timing of screening—without this, it is difficult to exclude confounding factors as an explanation for any patterns that emerge;
- Inclusion of a broad range of timings for the screening, with a particular focus on the early period (30 to 120 days after return from deployment);
- Systematic examination of those with and without recommendation for follow-up care, for the purposes of determining both the appropriateness of the referral and the performance characteristics of the screening instruments; and
- Inclusion of returning service members with a broad range of deployment experiences.

Validation of screening instruments for the post-deployment context is particularly critical for two-stage screening programs (such as those in the US) that require an interview only if certain screening thresholds are crossed on the questionnaires. Recent work at USAMRU-E is reassuring in this regard[39].

It is unfortunately likely that the optimal screening time varies from person to person, depending on their personal characteristics and deployment experiences. Longitudinal studies of individuals going though the process of post-deployment re-integration will also help define the range of different "recovery" curves.

The preference of about half of CF members for additional post-deployment screening in the first two months after return from deployment is potentially problematic. Prior to 120 days after return, we have evidence that the referral rate will be higher, perhaps inappropriately so. This has obvious resource implications, and members with self-limited adjustment issues may be harmed if they are labelled as being mentally ill. Logistically, screening in this period (much of which is taken up by various forms of leave) would be a challenge: We were able to perform screening during our target interval of 120 to 180 days after redeployment in only 16.8% of our members; doing so earlier would be an ever greater challenge.

Finally, it is important to keep in mind that members may view post-deployment screening differently from deployment health specialists. Simply put, post-deployment screening may be about more than just screening: Participants may find value in just ventilating, and in receiving positive support, feedback, and advice.

Demystifying mental health care may also decrease future barriers to care-seeking in the future. The value of reassurance may be substantial: While clinicians may imagine that patients chose to be screened for a condition out of a carefully reasoned decision that their quality-adjusted life-years will be enhanced as a result, the fact is that a desire for reassurance is the strongest motivator. Accordingly, evaluation of screening programs should take into account other potentially relevant outcomes beyond simple case-finding.

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